

WHAT IS CLAIMED IS:

1. A method of quantifying the amount of adsorbate adsorbed on a solid comprising:
 - a. contacting the solid with an adsorbate for a period of time;
 - 5 b. contacting the solid with an inert fluid while ramping the temperature of the solid resulting in a specified ramp rate with a fixed heat input profile with respect to a blank run;
 - c. measuring the change in temperature of the solid during the contact with the inert fluid;
 - 10 d. determining a mathematical function, $f(t)$, describing the deviation of the measured changes in temperature over time from the specified temperature ramp rate;
 - e. determining a value of the desorption order, "m", that yields a linear relationship of $\ln[(-d N_A / dt) / N_A^m]$ vs $1/T$ where " N_A " is the total moles of adsorbate adsorbed on the solid, " t " is time, " t_p " is the time at which the extremum is observed, and " T " is temperature;
 - 15 f. determining the activation energy for desorption using :

$$-v \cdot m \cdot N_A^{(m-1)} \cdot \exp\left(\frac{-E_d}{RT_p}\right) + \frac{E_d}{RT_p^2} [\beta - f'(t)] / t_p = 0 \quad (7)$$

when "m" is determined above to be 1, or using

$$-10^{13} \cdot \exp\left(\frac{-E_d}{RT_p}\right) + \frac{E_d}{RT_p^2} [\beta - f'(t)] / t_p \quad (8)$$

20 when "m" is determined above to be other than 1; and

- g. determining the quantity of adsorbate adsorbed on the solid using:

$$N_A = \int_{t_1}^{t_2} f(t) \cdot \frac{C_{ps}}{\Delta H} dt \quad (1')$$

where “C_{ps}” is the specific heat of the solid and ΔH is the heat of adsorption of adsorbate “A” which is substantially equal to the activation energy for desorption determined above.

- 5 2. The method of Claim 19 wherein steps (a) through (g) are conducted on a plurality of solids.
3. The method of Claim 19 wherein the expression describing the deviation of the measured changes in temperature over time from the specified temperature ramp rate, f(t) is a polynomial described as:

$$10 \quad f(t) = \sum_{i=0}^n a_i \cdot t^i$$

4. A method of determining at least one surface property of at least one solid or mixture of solids comprising:
 - 15 a. contacting the solid(s) or mixture(s) of solids with an adsorbate for a period of time;
 - b. contacting the solid(s) or mixture(s) of solids with an inert fluid while measuring the change in temperature of the respective solid(s) or mixture(s) of solids using a detector and while concurrently ramping the temperature at a controlled ramp rate using temperature controllers to a temperature sufficient to
 - 20 desorb adsorbed fluid;
 - c. controlling the heating of the samples and maintaining the controlled temperature ramp rate using the measured change in temperature of the solid(s) or mixture(s) of solids;

- d. measuring the power requirements of the temperature controllers; and
- e. determining at least one surface property of the solid(s) or mixture(s) of solids from the measured power requirements as a function of time.

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